DETAILED ACTION

Interview

The obvious double patenting rejection, bullet 12 below, has been corrected to include the application number and claims which teach rocking the vessel.

Election/Restrictions

1. Newly submitted claim 43 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claim 43 is directed to an apparatus which is independent or distinct from the invention originally claimed because the claim is drawn to an apparatus which lacks the same special technical feature to the process claims, as discussed previously in the office action filed 10/4/2007.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 43 withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 28 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 28 recites, “substituted by the nitrogen-containing gas gradually" in line 2.

It is unclear what "gradually" is intended to define. In other words, there is no clearly defined rate for "gradually".

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1, 3-7, 9-12, 17, 18, 20 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura et al ("Growth of a Large GaN single Crystal using the liquid phase epitaxy (LPE) Technique") in view of Yamada et al (US 5,366,552).

Kawamura et al teaches a method of LPE comprising heating a reaction vessel (crucible) containing Na (an alkali metal) and gallium (Ga) to 800°C. (pg L4). Kawamura et al also teaches

feeding a nitrogen containing gas (nitrogen and ammonia) and thereby allowing the Ga and nitrogen to react with each other to grow Group III nitride single crystals. (pg L4 and Abstract).

Kawamura et al does not teach the flux of the metal element and the Group III element are stirred to be mixed together with a nitrogen containing gas and mixed by rocking the reaction vessel.

In a method of Liquid Phase Epitaxy, note entire reference, Yamada et al teaches a rotation of a growth chamber is performed such that the angle of rotation of the growth chamber is a function of time elapsed, which period may be variable with the progress of liquid phase epitaxial growth (col 4, ln 1-40), which clearly suggests rocking the chamber during epitaxial growth. Yamada et al also teaches by tilting the chamber the solution is kept in a homogenous condition and liquid phase epitaxial growth is achieved uniformly. (col 4, ln 40 to col 5, ln 5). Yamada et al also teaches the movement of the chamber stirs the solution, thus accelerates growth rate. (col 5, ln 1-30 and col 2, ln 1-60).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Kawamura et al's LPE process by rocking the vessel, as taught by Yamada et al, to stir the melt, thereby improving uniformity by stirring.

In regards to the metal element and at least one Group III element are stirred together with the nitrogen containing gas and mixed together by rocking, the combination of Kawamura et al and Yamada et al teaches crystal growth by combining Gallium metal, Na and nitrogen gas (Kawamura et al pg L4), and rotating the chamber during growth to stir (col 4, ln 25-65), this clearly suggests rocking to stir the metal, Group III and nitrogen gas.

Referring to claim 3, the combination of Kawamura et al and Yamada et al teaches rotation of the growth chamber. (‘552 col 4, ln 40-65).

Referring to claim 4, the combination of Kawamura et al and Yamada et al teaches a thin film formed by MOCVD and growth on the film. (Kawamura pg L4).

Referring to claim 5, the combination of Kawamura et al and Yamada et al teaches growing continuously. (Kawamura pg L4).

Referring to claim 6-7, the combination of Kawamura et al and Yamada et al tilting the chamber to start and stop the liquid epitaxial growth process ('552 col 5, ln 35-50 and col 4, ln 25-67), which clearly suggests tilting the chamber to prevent the mixture from coming into contact with the substrate.

Referring to claims 9-12, the combination of Kawamura et al and Yamada et al teaches Ga metal to form GaN using a Na flux. (Kawamura pg L4).

Referring to claim 17, the combination of Kawamura et al and Yamada et al teaches a temperature of 800°C and a pressure of 5 atm (0.5 MPa) (Kawamura pg L4).

Referring to claim 18, the combination of Kawamura et al and Yamada et al teaches nitrogen and ammonia. (Kawamura pg L4).

Referring to claim 20, the combination of Kawamura et al and Yamada et al teaches single crystals of GaN. (Kawamura pg L4).

Referring to claim 26, the combination of Kawamura et al and Yamada et al teaches transparent GaN. (Kawamura pg L5).

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura et al ("Growth of a Large GaN single Crystal using the liquid phase epitaxy (LPE) Technique") in view of Yamada et al (US 5,366,552), as applied to claims 1, 3-7, 9-12, 17, 18, 20 and 26 above, and further in view of D'Evelyn et al (US 6,398,867).

The combination of Kawamura et al and Yamada et al teaches all of the limitations of claim 8, as discussed previously, except mixing by heating a lower part to generate heat convection.

In a method of growing GaN, note entire reference, D'Evelyn et al teaches dissolving Ga in a solvent and heating to generate convention which stirs the reaction so as to result in enhanced GaN growth rate, uniformity and homogeneity. (col 7, ln 1-67).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Kawamura et al and Yamada et al to generate convection, as taught D'Evelyn et al, to improve growth rate, uniformity and homogeneity.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura et al ("Growth of a Large GaN single Crystal using the liquid phase epitaxy (LPE) Technique") in view of Yamada et al (US 5,366,552), as applied to claims 1, 3-7, 9-12, 17, 18, 20 and 26 above, and further in view of Kawamura et al ("Synthesis of Bulk GaN single crystals using Na-Ca flux").

The combination of Kawamura et al and Yamada et al teaches all of the limitations of claim 14, as discussed previously, except the ratio of Ca to the sum of Na and Ca is in the range of 0.1 mol% to 99 mol%.

In a method of making GaN using a Na-Ca flux, note entire reference, Kawamura et al teaches Ca increases the yield of GaN crystal and transparent GaN single crystals are easier to grow. (Abstract). Kawamura et al also teaches a variety of concentrations of Na and Ca which are within the claimed range of 0.1-99 mol%. (Table 1 and pg L1440-1441).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Kawamura et al and Yamada et al by adding Ca, as taught by Kawamura et al, to increase yield and making growing transparent crystals easier.

8. Claim 21, and 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura et al ("Growth of a Large GaN single Crystal using the liquid phase epitaxy (LPE) Technique") in view of Yamada et al (US 5,366,552), as applied to claims 1, 3-7, 9-12, 17, 18, 20 and 26 above, and further in view of Shibata et al (US 6,270,569).

The combination of Kawamura et al and Yamada et al teaches all of the limitations of claim 14, as discussed previously, except using impurities.

In a method of growing GaN from a melt, note entire reference, Shibata et al teaches Mg was added to a Ga melt to thereby grow a Mg doped GaN. (col 9, ln 15 to col 10, ln 55 and col 5, ln 40-60).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Kawamura et al and Yamada et al by doping with Mg, as taught by Shibata et al, to produce a p-type GaN having desirable electrical characteristics.

Referring to claim 25, the combination of Kawamura et al, Yamada et al and Shibata et al teaches Mg.

Referring to claim 21, the combination of Kawamura et al, Yamada et al and Shibata et al teaches a substrate having a dimension of 25 mm (2.5 cm). ('569 col 13, ln 35-65).

9. Claim 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura et al ("Growth of a Large GaN single Crystal using the liquid phase epitaxy (LPE) Technique") in view of Yamada et al (US 5,366,552), as applied to claims 1, 3-7, 9-12, 17, 18, 20 and 26 above, and further in view of Hawrylo et al (US 3,811,963).

The combination of Kawamura et al and Yamada et al teaches all of the limitations of claim 27, as discussed previously, except the stirring is carried out in an atmosphere of inert gas and then nitrogen containing gas is substituted.

In a method of GaN growth from the liquid phase, note entire reference, Hawrylo et al teaches a melt is formed which include gallium and materials of the melt are heated in an inert gas of hydrogen, and when the melt is completely molten, the flow of inert gas is stop and nitrogen is passed through the furnace. (col 2, ln 1-70).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Kawamura et al and Yamada et al by melting in an inert gas atmosphere and then substituting to a nitrogen containing gas atmosphere, as taught by Hawrylo et al to prevent premature reaction of the melt before the mixture is uniform.

The combination of Kawamura et al, Yamada et al and Hawrylo et al teaches stirring by rocking prior to reaction and prior to reacting, heating under an inert gas atmosphere, then substituting with nitrogen containing to cause reaction.

Referring to claim 28, gradually is indefinite. The combination of Kawamura et al, Yamada et al and Hawrylo et al teaches substituting the gases, thus "gradually" is interpreted by the examiner such that flowing the nitrogen gas through the furnace after stopping the inert gas flow suggests gradually.

10. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura et al ("Growth of a Large GaN single Crystal using the liquid phase epitaxy (LPE) Technique") in view of Yamada et al (US 5,366,552), as applied to claims 1, 3-7, 9-12, 17, 18, 20 and 26 above, and further in view of JP 75011870 B ('870), an English Abstract is provided.

The combination of Kawamura et al and Yamada et al teaches all of the limitations of claim 30, as discussed previously, except mixing using a stirring blade.

In a method of making a Group III-V crystal using liquid phase epitaxy, '870 teaches a molten solution is stirred with a carbon stirrer to absorb oxygen in the solution and this produces crystal with a higher purity. (Abstract). '870 also teaches rotating the stirrer. (Fig 1).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Kawamura et al and Yamada et al by stirring using as stirrer, as taught by '870, to removing an oxygen impurity and produce a uniform melt.

Double Patenting

11. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined

application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

12. Claims 1, 3-12, 14, 17-18, 20-21, 24-28, and 30 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-36 of copending Application No. 11/661,013 Although the conflicting claims are not identical, they are not patentably distinct from each other because the combination of claims 1-36 overlap the materials instantly claimed materials and claims 19-20 claim rocking the reaction vessel; therefore clearly suggests the instantly claimed invention.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Arguments

13. Applicant's arguments with respect to claims 1, 3-12, 14, 17-18, 20-21, 24-28, and 30 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Scheel (US 3,858,553) teaches a rotating chamber for liquid phase epitaxial growth. (Abstract).

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. SONG whose telephone number is (571)272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Kornakov can be reached on 571-272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew J Song
Examiner
Art Unit 1792

MJS
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/Robert M Kunemund/
Primary Examiner, Art Unit 1792